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Bonelli

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(54) **EXTENSIBLE LAMINAR MATERIAL, IN PARTICULAR FOR SANITARY ARTICLES, AND RELATIVE MANUFACTURING METHOD**

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A61F 13/49 (2006.01)
(Continued)

(52) **U.S. Cl.**
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(Continued)

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,568,344	A	2/1986	Suzuki et al.
2011/0040273	A1	2/2011	Sablone et al.
2011/0046594	A1	2/2011	Sablone

OTHER PUBLICATIONS

Italian Search Report dated Nov. 18, 2016 for Application No. UB20161212.

(Continued)

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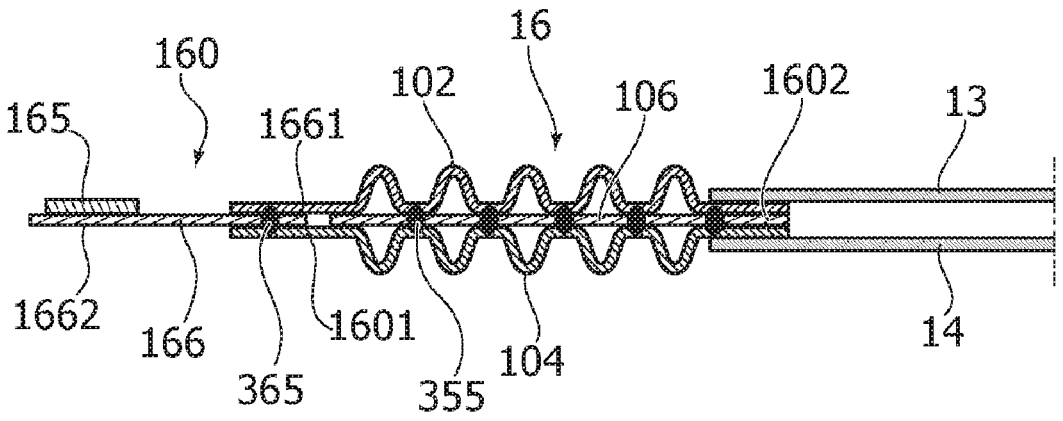
(57) **ABSTRACT**

A transversely extensible elastic laminar web material comprising a first and a second web material each of which defines a first and a second distal region adjacent to corresponding longitudinal side edges and a central region between the aforesaid distal regions, at least one web of elastomeric material applied to these central regions of the first and second web materials and a plurality of connection formations applied to at least one distal region of said first and second web materials and projecting from a respective longitudinal edge. In the transversely extensible elastic laminar web material, the elastomeric web material and the connection formations are interposed between said first and second web materials and are joined thereto by mechanical welds.

8 Claims, 12 Drawing Sheets



(51) **Int. Cl.**

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A61F 13/496	(2006.01)
A61F 13/62	(2006.01)
B29C 65/08	(2006.01)
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A61F 13/58	(2006.01)
A61F 13/64	(2006.01)
B32B 5/02	(2006.01)
B32B 5/06	(2006.01)
B32B 5/14	(2006.01)
B32B 7/04	(2006.01)
B32B 25/10	(2006.01)
B32B 27/12	(2006.01)
B32B 3/02	(2006.01)
B32B 3/08	(2006.01)
B32B 3/26	(2006.01)
B32B 3/28	(2006.01)
B29L 31/48	(2006.01)

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CPC ***B32B 5/142*** (2013.01); ***B32B 7/045*** (2013.01); ***B32B 25/10*** (2013.01); ***B32B 27/12*** (2013.01); *A61F 2013/15869* (2013.01); *B29L 2031/4878* (2013.01); *B32B 2250/03* (2013.01); *B32B 2250/40* (2013.01); *B32B 2307/51* (2013.01); *B32B 2555/02* (2013.01)

(56) **References Cited**

OTHER PUBLICATIONS

EPO Extended European Search Report dated Jul. 27, 2017 for European Application No. 17158307.3.

FIG. 1

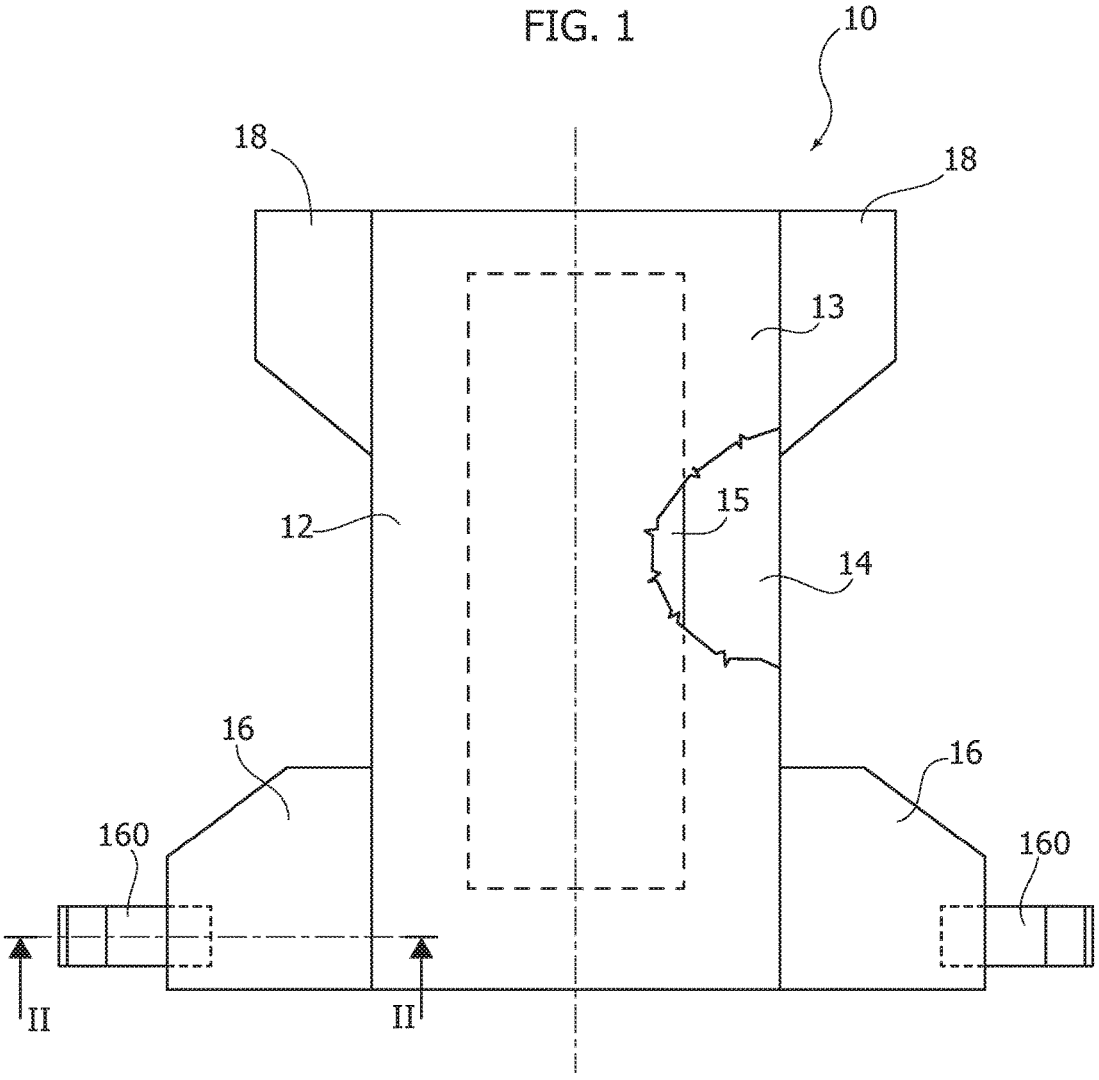

10
18
18
13
12
15
14
16
16
160
160
II
II

FIG. 2

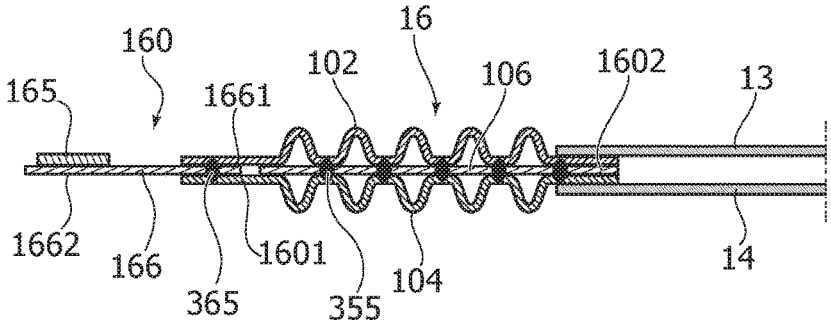
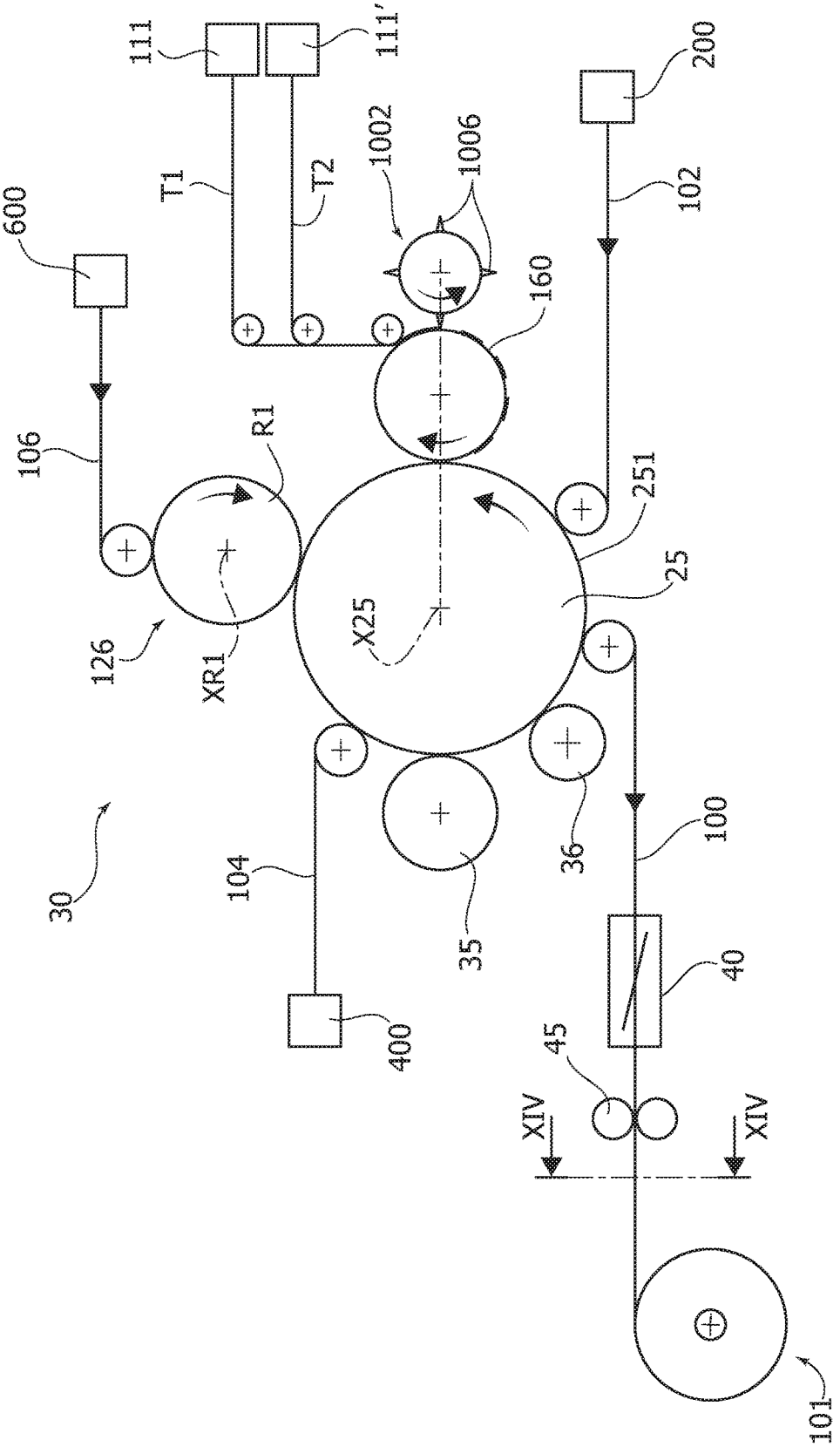

160
16
165
1661
102
106
1602
13
1662
166
1601
365
355
104
14

FIG. 3


111
111'
200
T1
T2
1002
1006
600
102
160
106
R1
251
25
126
XR1
X25
104
36
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35
40
400
45
XIV
XIV
101

FIG. 4

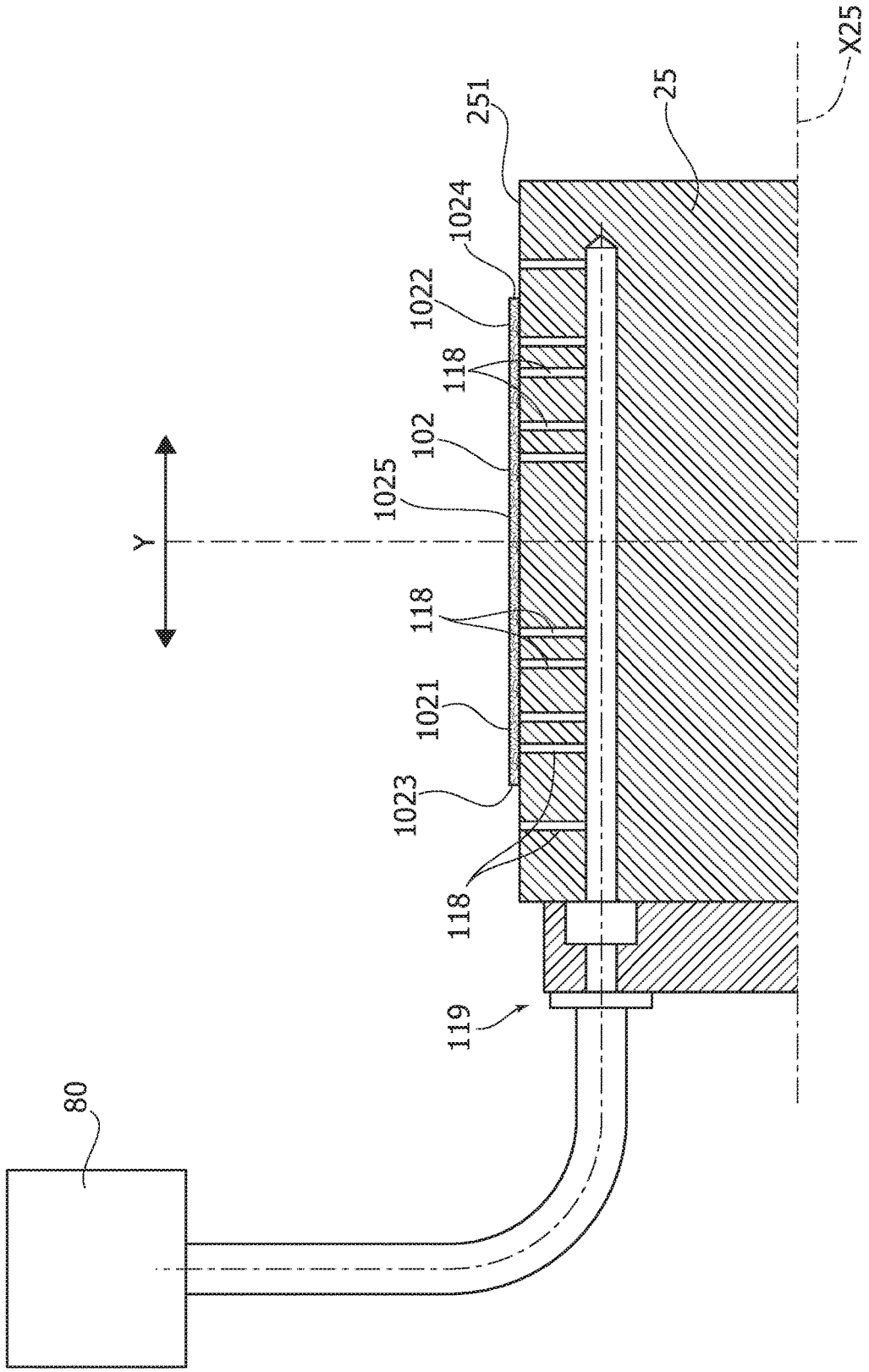


FIG. 5

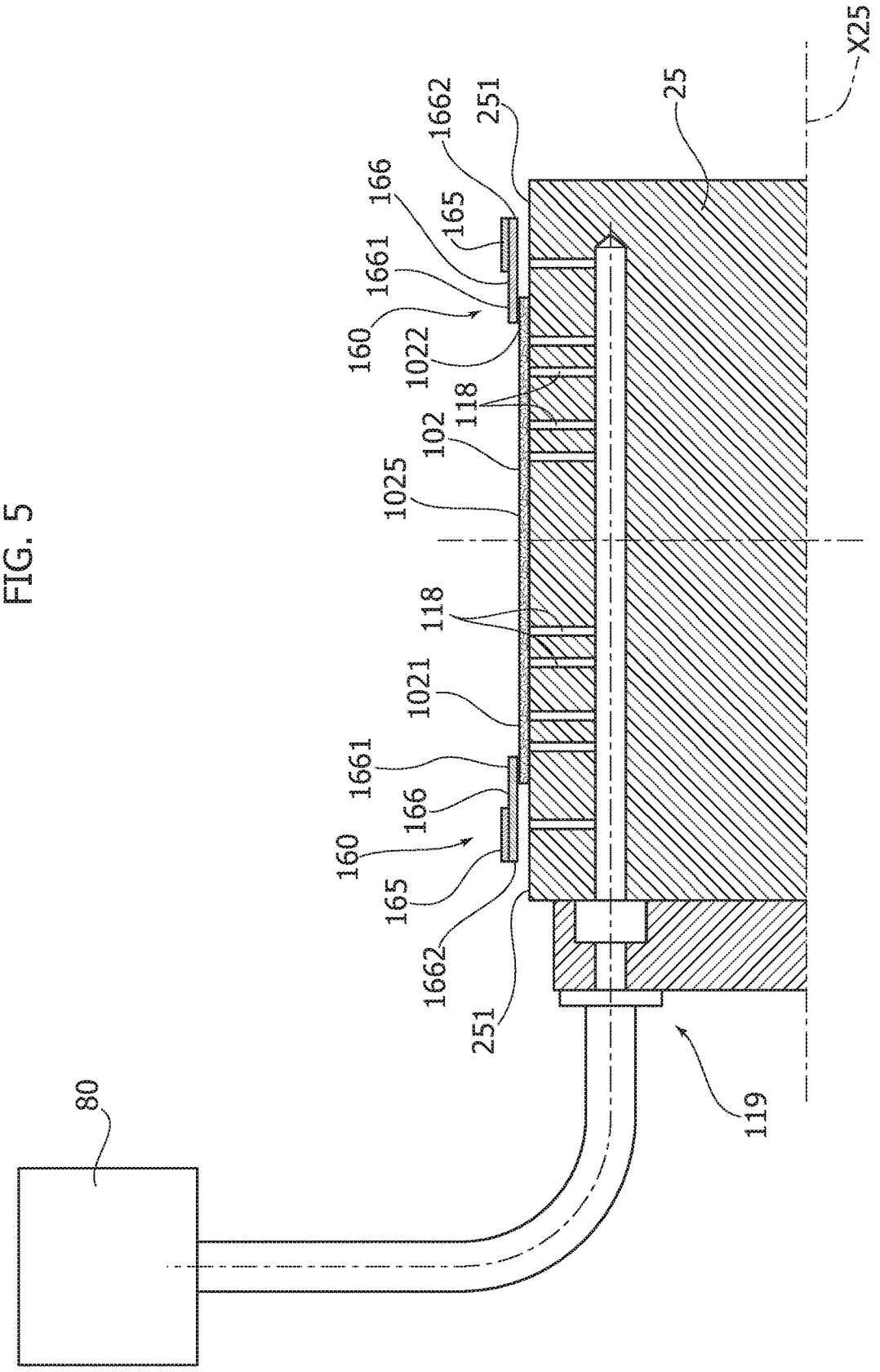
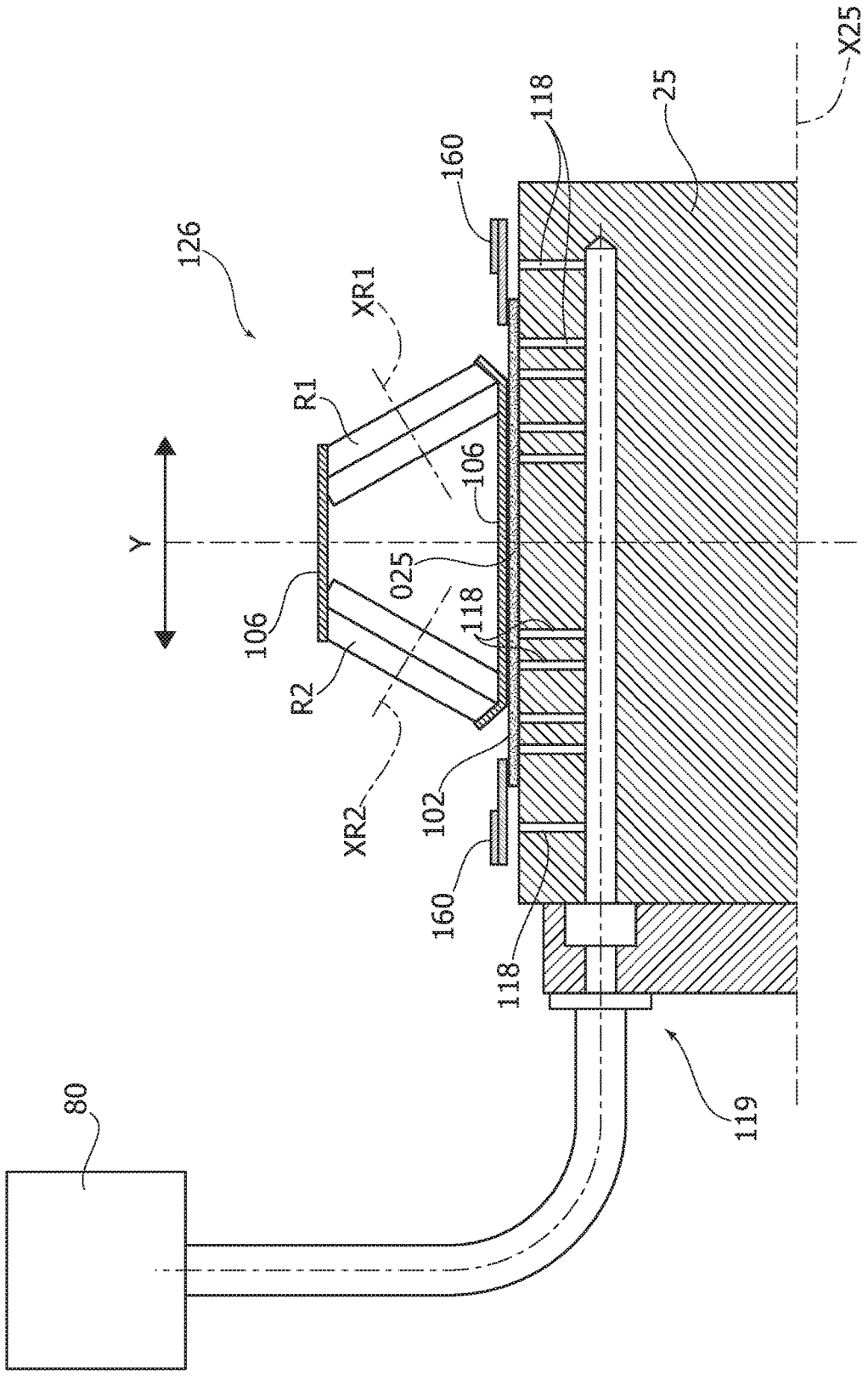

X25
25
1662
251
166
165
1661
160
1022
118
102
1025
118
1021
1661
166
160
165
1662
251
80
119

FIG. 6


X25
118
25
160
126
XR1
R1
106
Y
025
118
106
R2
XR2
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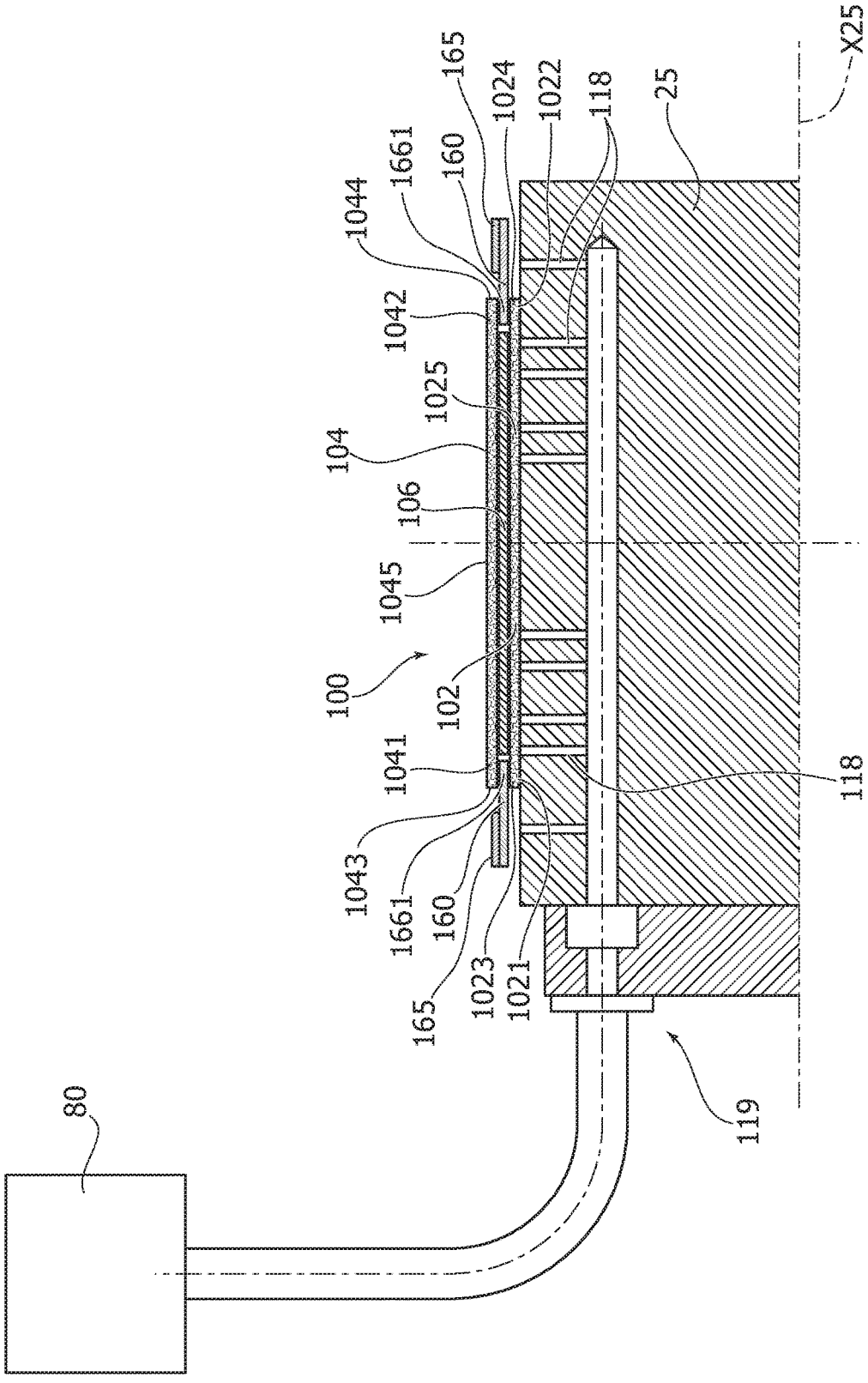
160
118
80
119

FIG. 7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1024
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118
25
1661
160
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1042
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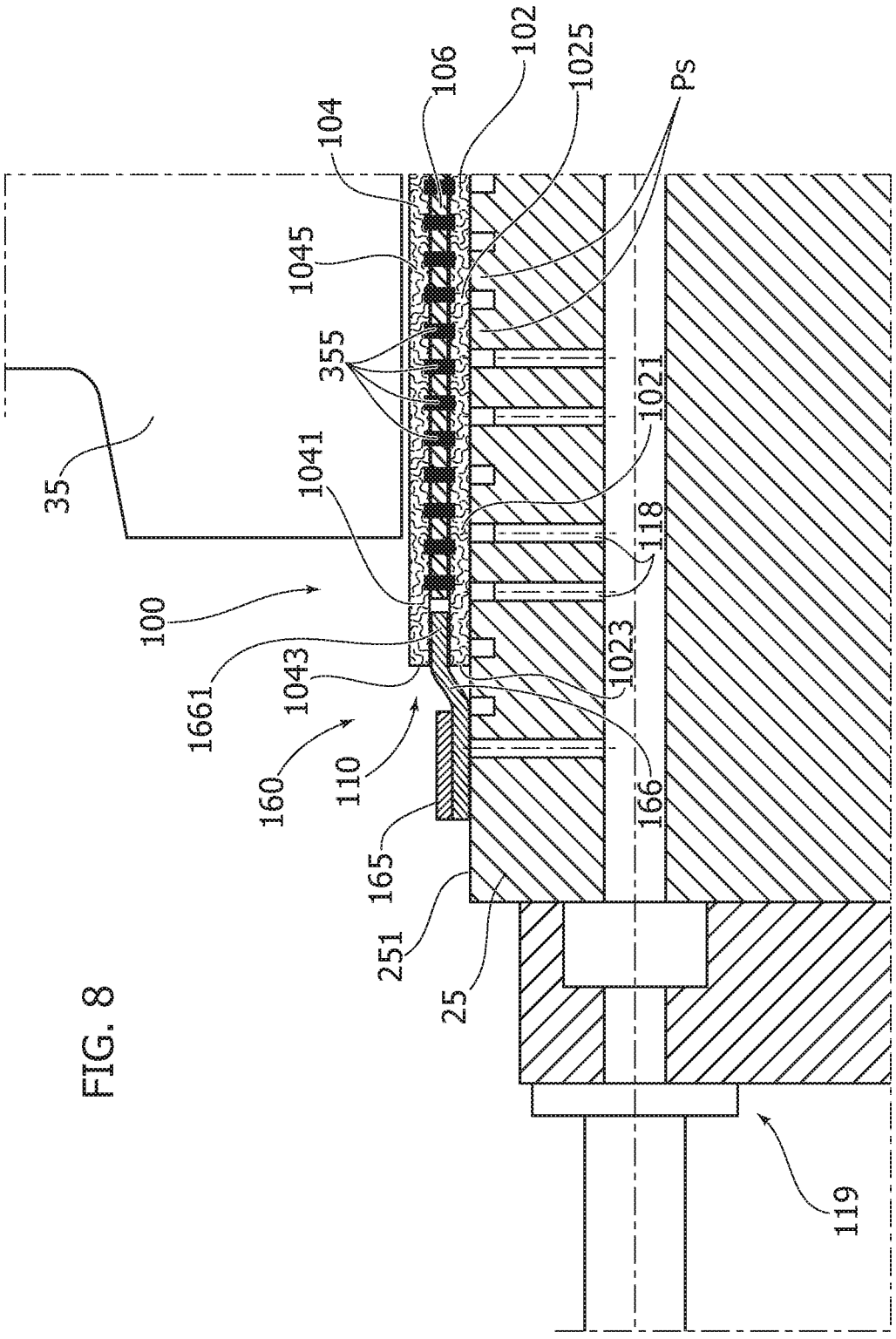
1043
1661
160
165
1023
1021
119
80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100
1661
1043
1041
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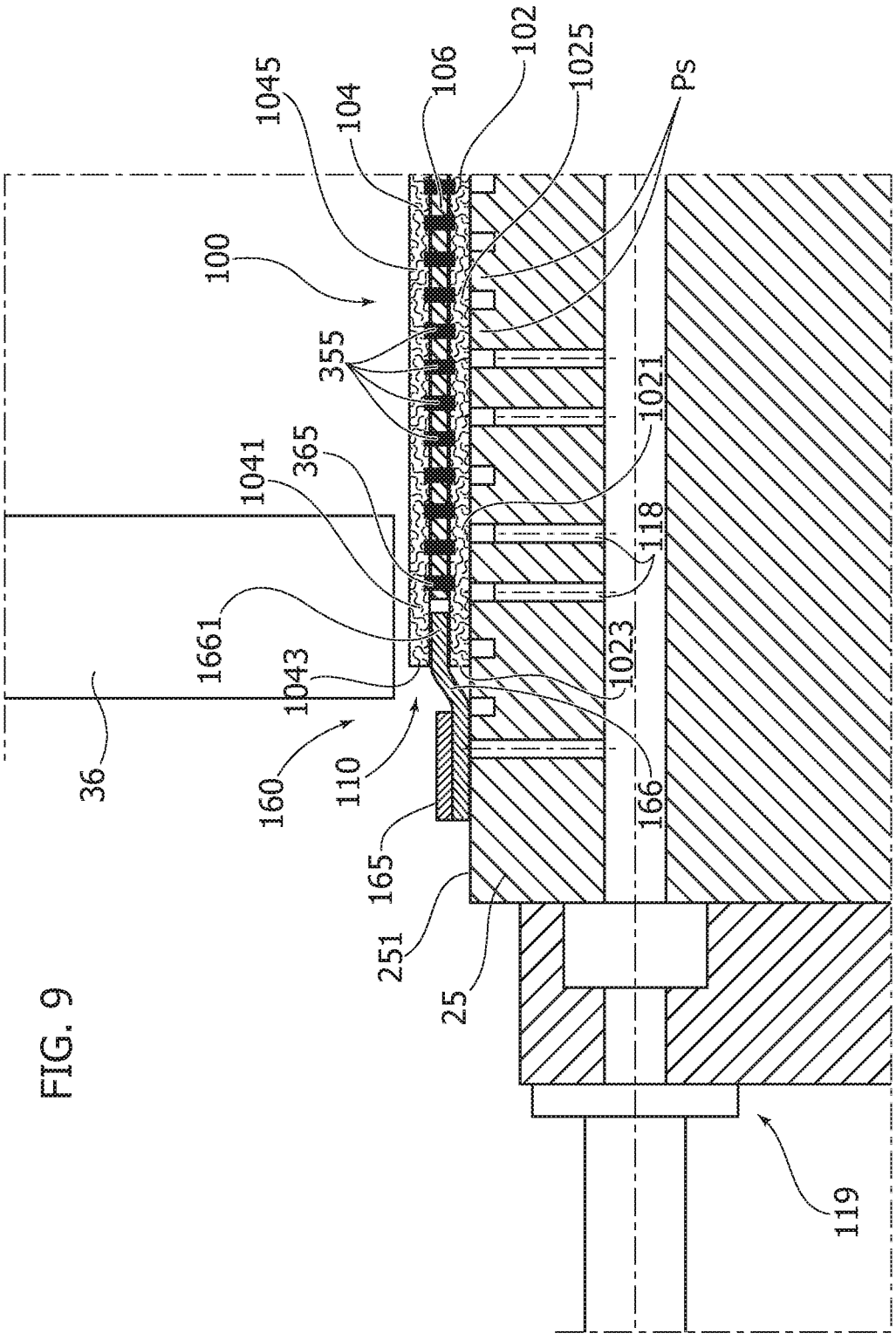
106
102
1025
Ps
355
1021
118
1023
166
160
110
165
251
25
119

FIG. 8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1025
Ps
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1021
1041
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1661
1023
1043
36
160
110
166
165
251
25
119

FIG. 9

FIG. 10

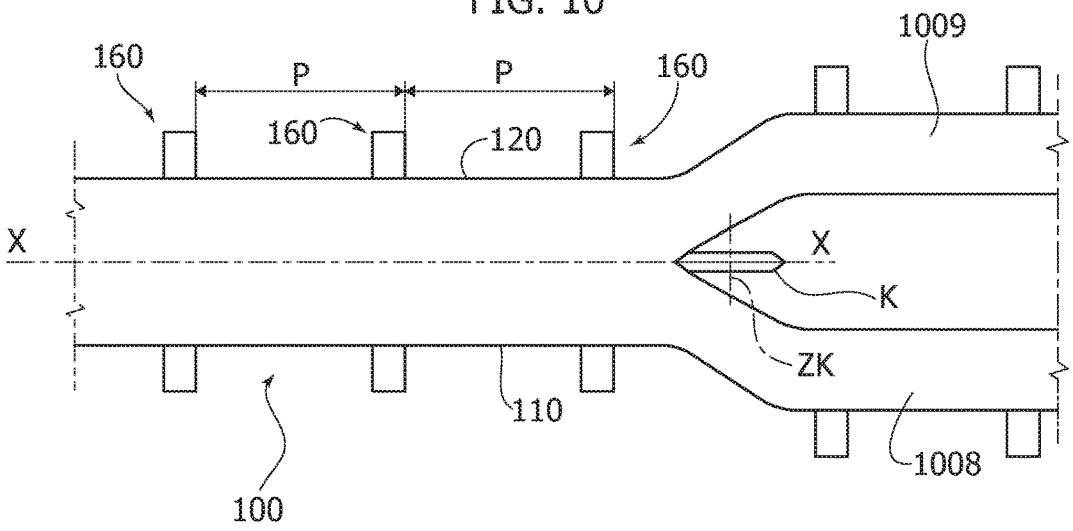


FIG. 11

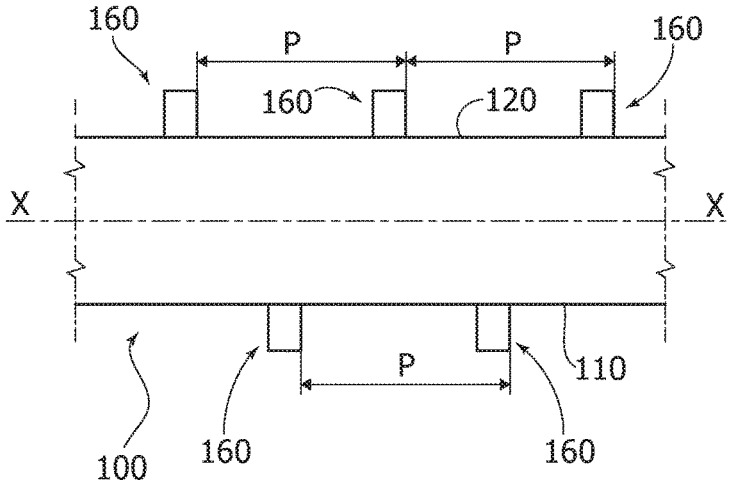


FIG. 12

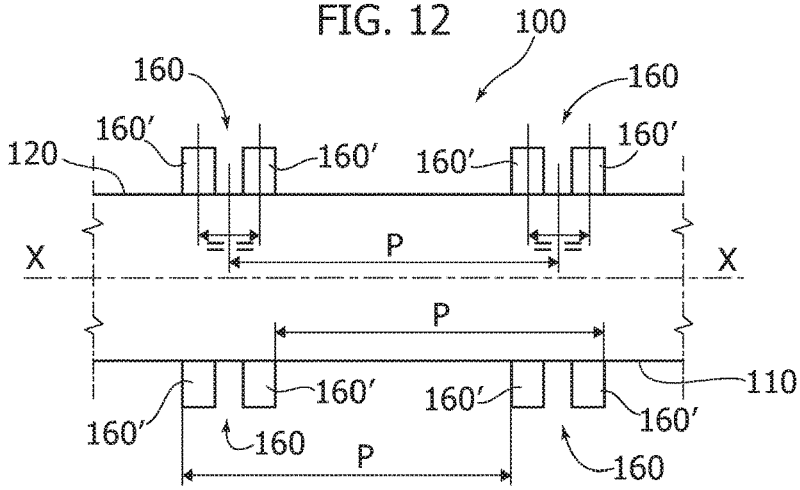


FIG. 13

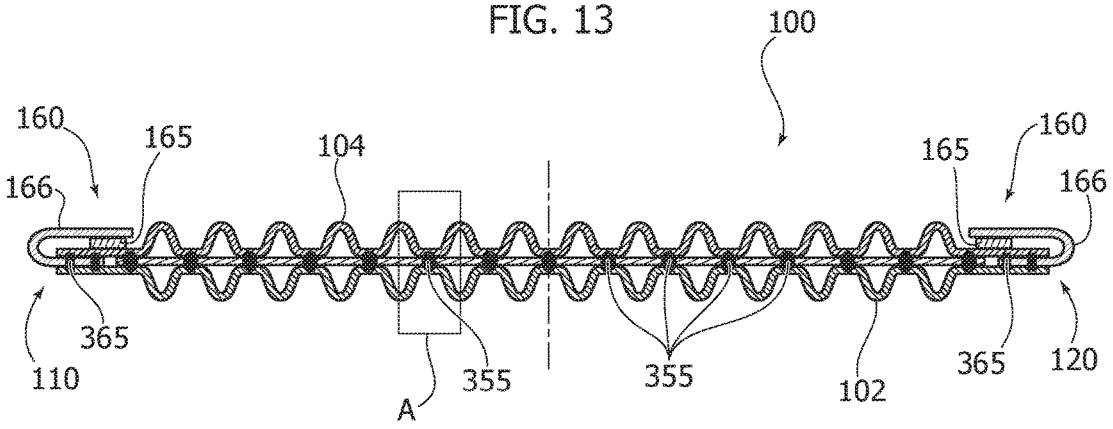

100
160
165
104
166
165
160
166
365
110
A
355
355
102
365
120

FIG. 14

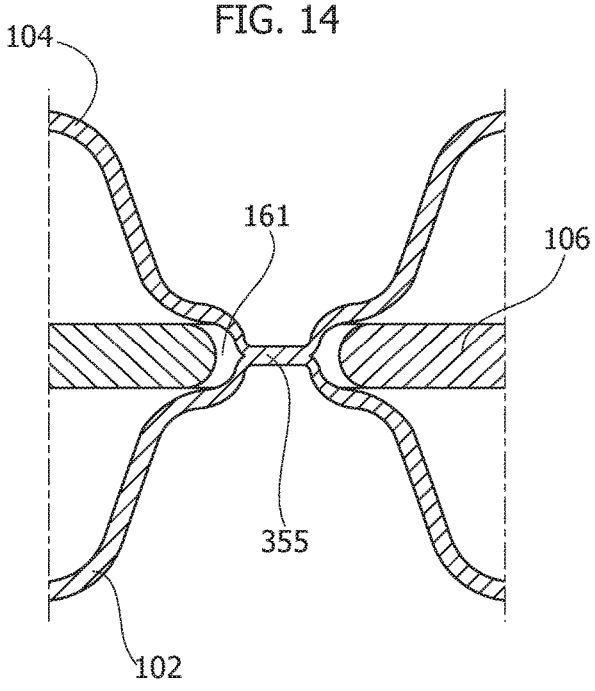
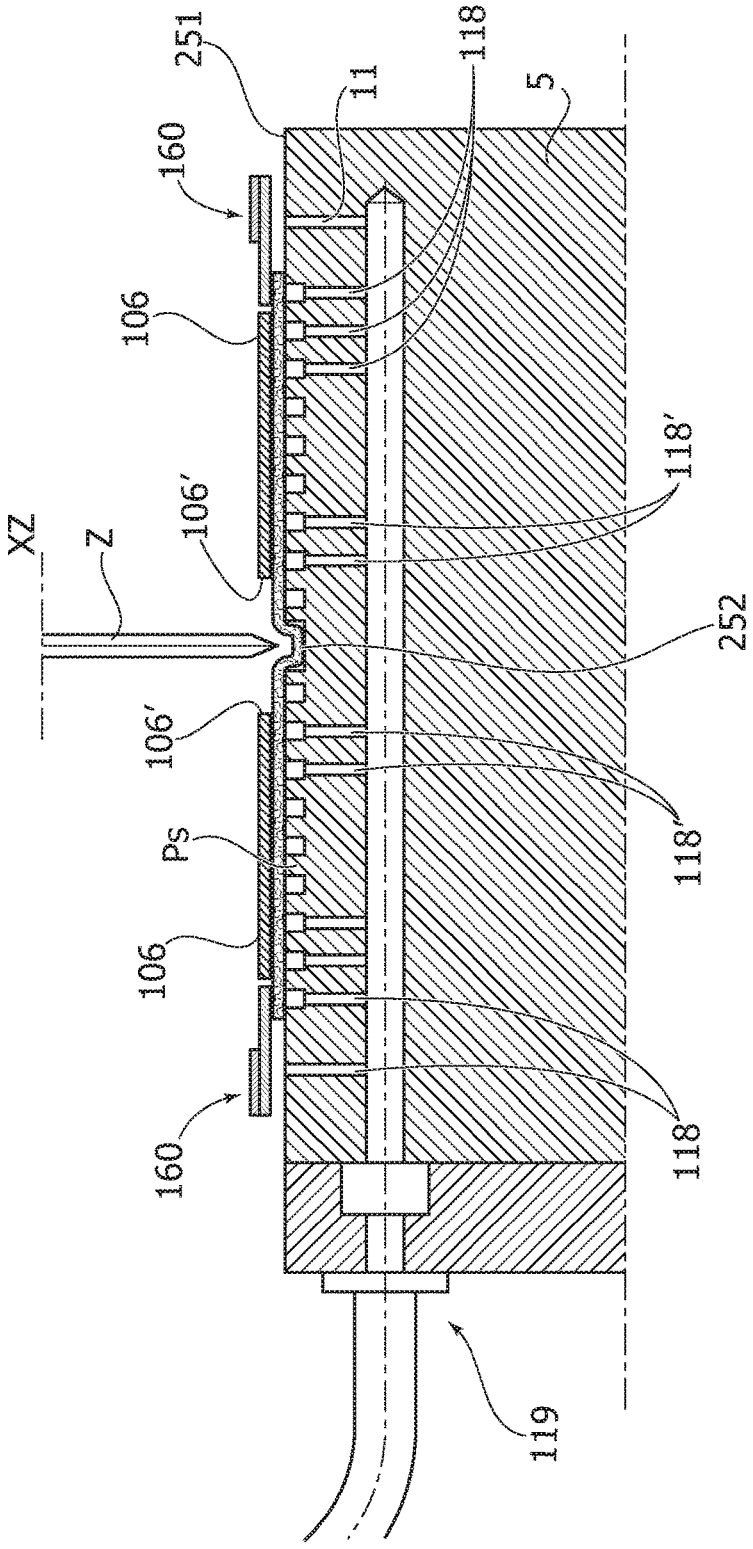

104
161
106
355
102

FIG. 15



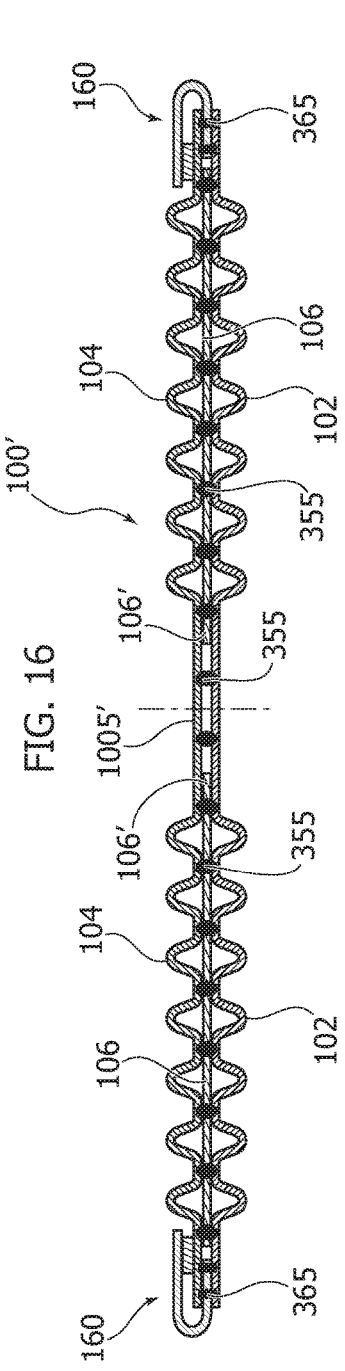


FIG. 16

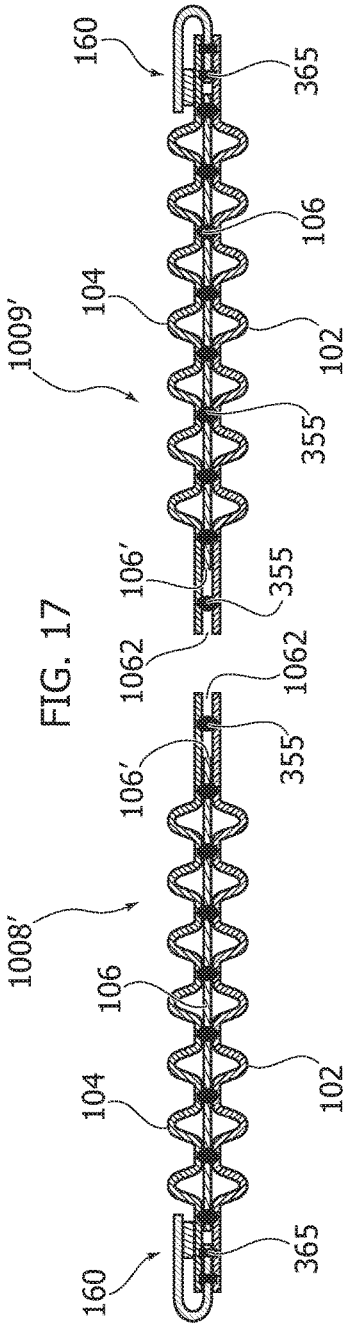


FIG. 17

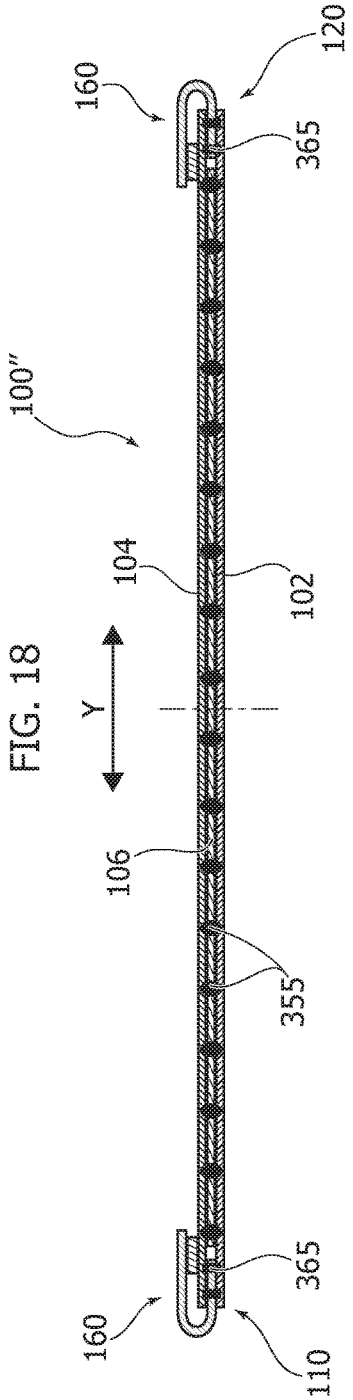


FIG. 18

EXTENSIBLE LAMINAR MATERIAL, IN PARTICULAR FOR SANITARY ARTICLES, AND RELATIVE MANUFACTURING METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims benefit of Italian patent application number 102016000021569, filed Mar. 1, 2016, which is herein incorporated by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a method for producing a semi-finished web product comprising a transversely extensible elastic laminar web material provided with connection formations.

The present description has been developed with particular reference to the possible application of the transversely extensible elastic laminar web material in the production of disposable absorbent sanitary products in the form of wearable pants, such as, for example, diapers for children and/or absorbent sanitary articles for incontinent adults.

Description of Prior Art

For some time, absorbent sanitary articles wearable as pants have a configuration that comprises a rectangular-shaped central body or chassis that is capable of having a basin arrangement around the crotch region of the user and at least one pair of side panels, which extend on opposite sides of at least one of the ends, front or rear, of the article provided with connection or closing formations capable of joining together the front and rear ends of the chassis of the absorbent article around the user's waistline.

There are many patent documents that address the problem of producing suitable materials for the production of side panels capable of combining characteristics of elastic extensibility as well as breathability.

An important development in the production of these materials is outlined in the document TO2008A000325, owned by the applicant, in which the disclosures are provided to produce an extensible laminar material obtained by coupling together two sheets of non-woven fabric with an interposed layer of elastic material, using a combination of adhesive lines and welds.

In any case, any connection formations necessary for joining together the front and rear ends of the sanitary article must be applied on the material intended to be used to produce the side panels, thus giving it the characteristic underpants conformation.

As is known, the connection formations attached to the ends of the side panels, precisely due to the function that they perform—namely to maintain the absorbent article closed in its underpants conformation—are subject to very high stresses, which can easily lead to breakage of the joint between the material of the side panels and the connection formation itself.

To resolve this problem, the specialized manufacturers—many years ago—developed said connection formations with a Y-shape. These connection formations have a multilayer structure, which allows them to trap the side panel material between two laminar elements provided with a generous layer of adhesive. An example of a Y-shaped connection formation advantageously used for producing disposable sanitary articles is described in U.S. Pat. No. 4,369,786 entitled "Refastenable adhesive closure for disposable diapers or briefs" owned by the Avery International Corporation, Pasadena, Calif.

These solutions, while having led to satisfactory results, present problems related precisely to the complexity of their structure and to the need to use large quantities of adhesive which, as is known, belongs to a category of very polluting materials that have a high environmental footprint (carbon footprint). In addition to the above, the complex structure of the Y-shaped connection formations is reflected in a high cost, which is transferred to the selling price of the sanitary article.

To the above, it should be added that to produce the elasticized side panels, the use of significant quantities of adhesive may also be necessary.

Accordingly, the current state-of-the-art in the production of sanitary articles with elasticized side panels provided with connection formations presents problems related to the complexity and to the massive use of adhesives that it entails.

SUMMARY OF THE INVENTION

The present invention aims to provide a transversely extensible elastic laminar web material provided with connection elements with a simple structure able to excellently satisfy the requirements of environmental sustainability—outlined above—and also the cost requirements.

According to the present invention, this object is achieved thanks to a transversely extensible elastic laminar web material for side panels comprising connection formations having the characteristics referred to specifically in the claims that follow.

The invention also relates to the corresponding manufacturing method.

The claims form an integral part of the technical disclosure provided here in relation to the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described, purely by way of non-limiting example, with reference to the attached drawings, wherein:

FIG. **1** is a general schematic view of a sanitary article, shown in an extended position, producible with the use of an extensible laminar material of the type described herein.

FIG. **2**, essentially similar to a cross-section along the line II-II of FIG. **1**, represents an element produced with an extensible laminar material of the type described herein.

FIG. **3** is a schematic view of an apparatus for producing a transversely extensible laminar web material according to a preferred embodiment of the present invention.

FIGS. **4** to **9** illustrate successive production steps of such a material.

FIGS. **10** to **12** represent possible embodiments of the material subject of the present invention.

FIG. **13** illustrates the structure of the material subject of the present invention according to the cross-section along the line XIV-XIV of FIG. **3**.

FIG. **14** is an enlarged detail of FIG. **13**.

FIG. **15** illustrates a possible variant of the method of producing the material.

FIGS. **16**, **17** and **18** illustrate the structures of the material subject of the present invention according to further preferred embodiments.

In the following description, identical or similar components, or that perform the same function will be identified with the same reference numeral.

It is also appreciated that the drawings are schematic, are not to scale and the size ratios are not respected.

DETAILED DESCRIPTION

In the following description, various specific details are illustrated aimed at a thorough understanding of the embodiments. The embodiments can be implemented without one or more of the specific details, or with other methods, components, materials, etc. In other cases, known structures, materials or operations are not shown or described in detail to avoid obscuring various aspects of the embodiments.

The reference to "an embodiment" in the context of this description indicates that a particular configuration, structure or characteristic described in relation to the embodiment is included in at least one embodiment. Therefore, phrases such as "in an embodiment", possibly present in different places of this description do not necessarily refer to the same embodiment. Moreover, particular configurations, structures or characteristics can be combined in any convenient way in one or more embodiments.

The references used here are only for convenience and do not therefore define the field of protection or the scope of the embodiments.

The following clarifies the meaning of some terms that will be encountered in the rest of the discussion:

the term "elastic" or "elastomeric" defines the properties that a material possesses to resume its original shape and size once it is no longer stressed by the force that caused it to deform.

Typically, the term identifies a material that can be deformed by at least 25% of its original dimension at rest (or rather, stress-free) and that, once the force causing the deformation is removed, is able to recover at least 10% of the deformation. Generally, it is preferred that the elastic or elastomeric material is able to deform (or extend or stretch) by at least 100% and even more preferably by 300% with respect to its resting dimensions (relaxed) and is able to recover, once the elongation force (or deformation) is removed, at least 50% of its elongation;

the term "web" identifies a strip of flexible material that has much larger dimensions of length and width than the thickness. The web materials are typically supplied in rolls (or reels). Examples of web materials are non-woven fabric or elastomeric material films; and

the terms "front" and "rear" are only used to distinguish between the two ends of an absorbent sanitary article and therefore do not have specific importance regarding the manner in which the aforesaid article is finally worn.

In FIG. **1**, the reference number **10** indicates, in its entirety, a sanitary product wearable as pants, here illustrated in a flat extended position. It is, in the example illustrated here, a conventional-type absorbent sanitary article, commonly known as pant diaper for children or incontinence pads for incontinent adults, intended to be sold open and to be closed as pants after being placed on the wearer's body. The solution described here is, in any case, also applicable to the articles currently known as "reclosable training pants" intended to be sold already closed in their underpants configuration, ready to be worn by the user, but provided with connection formations that can be easily opened and, if necessary, also closed.

The product **10** illustrated here comprises a central body **12** intended to be applied around the user's groin region in a general U-shaped conformation.

The central body or chassis **12** has a structure in which the following are usually recognizable (in addition to various other accessory elements):

a top layer or "topsheet" **13** permeable to body fluids, intended to face towards the user's body;

a lower layer or "backsheet" **14** impermeable to body fluids, intended to face outwards, i.e. in the opposite position with respect to the user's body; and

an absorbent core **15**, interposed between the topsheet **13** and the backsheet **14**.

A pair of front side panels **18** and a pair of rear side panels **16** are typically present at the front and rear ends of the central body **12**.

In the preferred embodiment illustrated in FIG. **1**, the rear side panels **16** are typically elastic and each of them is provided with a proximal edge **1602** connected to the central body **12**, and a distal edge **1601** that typically has a connection formation **160**, which allows the two front and rear ends of the central body **12** to be joined together, giving it the characteristic underpants conformation.

The connection formations **160** can be created in various forms and with different combinations of materials, which can give rise to various solutions known in the art.

Typically, the various connection formations **160** available in the market, are distinguished from each other by the closing means **165**, which can be an adhesive element or a component with micro-hooks, and by the supporting element **166**, which can be produced with the most varied range of materials, which, in turn, can be either elastic or non-elastic.

In the following description, for simplicity, reference will be made to the connection formations **160** that comprise closing means **165** with micro-hooks and non-elastic support elements **166**. On the support element **166** of each connection formation **160**, it is possible to identify a proximal region **1661** and a distal region **1662**. As illustrated in FIG. **2**, the proximal region **1661** is one that is typically connected to the distal region **1601** of the side panel **16**, formed by the transversely extensible elastic laminar web material **100** subject of the present invention, while the distal region **1662** carries the closing means **165** on it.

Suitable materials for producing a connection formation **160** can be:

for the supporting material **166**, a non-woven SMS fabric with polypropylene fibers and with a grammage of 50 g/m^2. A material with these characteristics is produced by DOUNOR SA, 30-32 Rue Vertuquet, 59960 Neuville-en-Ferrain, France, and is identified by the code: Hymel PPSM/50/E/O/S.

for the closing means **165**, a material provided with hook elements, such as Microplast ITEM-no:85445 in polypropylene of 100 g/m^2, can be advantageously used, produced and marketed by GOTTLIEB BINDER GmbH u. Co KG, Bahnhofstrasse 19, D-71088 Holzgerlingen, Germany.

The supporting element **166** and the closing means **165** can be joined together using adhesive or even more advantageously with thermomechanical and/or ultrasonic welds. In the case of joining with glue, a suitable adhesive for this type of application can be the Full-Hook™ NW 1192 F, produced and marketed by H. B. Fuller http://www.hbfuller.com.

The embodiment illustrated here refers to a sanitary product in which the elasticized side panels **16** are only present at the rear end of the central body **12**, while its front

end is provided with two wings **18**, which are typically made with a non-elastic material that contribute to confer the typical hourglass conformation to the article **10** (seen ideally in the open and extended position, as represented in FIG. **1**).

The representation of FIG. **1** is schematic in nature and intends to highlight that the solution described herein can be applied to a wide variety of possible constructive types of absorbent sanitary articles **10**.

For a more detailed description about the additional characteristics and materials that can typically be included in the article **10**, please refer to the wide range of existing literature on the subject.

The transversely extensible elastic laminar web material **100**, illustrated, for example, in FIGS. **10** and **11**, defines a longitudinal axis X-X and a first and a second longitudinal edge **110** and **120**, parallel to it, from which the connection formations **160** protrude, and typically has a layered structure formed of a first web material **102** and a second web material **104**—for example of non-woven fabric—between which a web of elastomeric material **106** is interposed.

As shown, for example, in cross-section in FIG. **7**, in the first web material **102**, it is possible to identify a first distal region **1021** and a second distal region **1022**, adjacent to the respective longitudinal side edges **1023**, **1024**, and a central region **1025** between said distal regions.

Similarly, in the second web material **104**, it is possible to identify a first distal region **1041** and a second distal region **1042**, adjacent to the respective longitudinal side edges **1043**, **1044**, and a central region **1045** between said distal regions.

Typically, the first and the second longitudinal edges **110** and **120** of the transversely extensible elastic laminar web material **100** are coincident with the respective first and second longitudinal edges **1023**, **1024**, **1043** and **1044** of the first and second web materials **102** and **104** that compose it.

To produce a transversely extensible elastic laminar material **100** provided with connection formations **160**, the first and the second web materials **102** and **104** can be constituted of non-woven fabric having a grammage, for example, in the order of 10 g/m^2. A material with these characteristics is produced by Fibertex Nonwovens A/S, Svendborgvej 16, 9220 Aalborg, Denmark, and is marketed under the name Hydrofobic NW SMS spunbond XW 010 01 001 or FW 010 01 001. A web of elastomeric material **106** suitable for this particular application could be the film known as CEX802WR, produced and marketed by the TREDEGAR CORPORATION of Richmond, Va., USA.

It is evident that the reference to these specific materials is purely illustrative, and should not be construed in a sense limiting the scope of the present description.

It should be emphasized that the connotation "first" and "second" is used in the present description solely to distinguish between two elements or two characteristics of the same element and has not, therefore, specific importance with regard to the manner in which the product is finally produced.

FIG. **3** illustrates a side elevational view of an apparatus **30** according to a preferred embodiment for producing a transversely extensible elastic laminar web material **100** provided with connection formations **160**, particularly suitable for use in producing the elasticized side panels **16**.

With reference to FIGS. **3** and **4**, the production apparatus **30** is typically fed with a first web material **102** supplied by an unwinding device of the rolls (or reels) of web materials **200**, well known in the art.

The web material **102** is typically placed on the outer surface **251** of a cylindrical roller **25**, rotating around its own horizontal axis X**25**.

In the preferred embodiment, the web material **102** can be retained and maintained in an extended condition on the outer surface **251** of the roller **25** thanks to a plurality of holes **118** and appropriate vacuum distribution means **119**, which allow the connection of the outer surface **251** of the roller **25** with a sub-atmospheric pressure source **80**, and which grasp the distal regions **1021** and **1022** of the first web material **102**, preventing it from shrinking transversely; the usefulness of retaining the material at the regions adjacent to the longitudinal side edges of the web material **102** will become clear in the following description.

In the art, various alternative devices to the vacuum are available for the transverse gripping of web materials, in fact, this result can be achieved in different ways: for example, anchoring of the first web material **102** onto the outer surface of the roller **25** with counter-rollers, or with retaining belts or, alternatively, producing side zones of the outer surface of the roller **25** with a high coefficient of friction, as described in the document EP 1 982 823 A2, by the same applicant, entitled "method and device for treating web material".

Subsequently, in the preferred embodiment illustrated in FIG. **5**, the connection formations **160** are typically applied, with the respective proximal regions **1661** overlapping with the distal regions **1021** and **1022** of the first web material **102** and with the distal regions **1662** that carry the relative closing means **165** projecting from the longitudinal edges **1023** and **1024** of the web **102**.

The operation of applying the connection formations **160** onto the first web material **102** can be implemented by means of an appropriate application device **1002**, well-known in the art, such as the cutting and pitch application device described in EP 1 864 768 A1 entitled "A cutting device, for example for producing sanitary products, and relative actuating methods" owned by the applicant. Each connection formation **160** is typically placed onto the web material **102** with a predefined and constant application pitch P so that each connection formation **160** is equidistant from the connection formation **160** that precedes it and the one that follows it, applied on the same distal region **1021**, **1022** of the web **102**.

A connection formation **160** can also be formed by a plurality of connection formations **160'**, suitably grouped, as represented in FIG. **13**; in this case as well, each multiple connection formation **160** is typically placed on the web material **102** with a predefined and constant application pitch P in such a way that each multiple connection formation **160** is equidistant from the multiple formation connection **160** that precedes it and from the multiple connection formation **160** that follows it, applied on the same distal region **1021**, **1022** of the web **102**.

The connection formations **160** can be applied on the web material **100** so as to protrude from only one edge or, more preferably, from both its longitudinal edges **110** and **120**, as shown for example in FIG. **7**. In the latter case, the connection formations **160** can be juxtaposed to each other, as shown in FIGS. **10** and **12**, or offset, as shown in FIG. **11**.

In the remainder of the document, without diminishing the generality in the discussion, reference will be made to the production of a semi-finished web product **100** provided with connection formations **160** that protrude from both its longitudinal edges **110** and **120**, and juxtaposed to each other, as illustrated in FIG. **10**. Such a transversely extensible elastic laminar web material **100** produced in this way

can be left intact, or, typically, can be cut with a knife K, in turn, along its longitudinal axis X-X, so as to form two webs of material **1008** and **1009** specular to each other, which are typically intended to be further processed so as to form the elastic side panels **16** to be applied on opposite longitudinal edges of the central body **12** of a sanitary product **10**.

In the preferred embodiment, the application unit **1002** of the connection formations **160** is typically fed with two web materials T**1** and T**2** that are segmented by the knives **1006**, which is equipped in such a way so as to obtain the connection formations **160** from these continuous webs.

The web materials T**1** and T**2** are typically supplied by unwinding apparatuses of rolls (or reels) of web material **111** and **111'**, also well-known in the art.

The connection formations **160**, once placed on the distal regions **1021** and **1022**, adjacent to the longitudinal side edges of the web **102**, are typically held in position on the roller **25** during the implementation of the subsequent steps of the method, by means of suitable retaining means, which in the preferred embodiment, can be suction holes **118** connected to the sub-atmospheric pressure source **80** with appropriate vacuum distribution means **119** as shown in FIG. **5**.

To maintain the connection formations **160** in the correct position on the first web material **102** during the various steps of the manufacturing method of the web material **100**, it is also possible to produce technical joints using modest quantities of adhesive (in the order of 1-3 g/m^2), capable of retaining the connection formations **160** on the web material **102** during the construction of the web material **100** but which, however, because of the modest amount of adhesive used, are not sufficient to ensure an adequate anchorage of the connection formations **160** on the material **100** when it is used as a side panel of a sanitary article **10**.

Adhesives able to produce this function of technical joints are known, for example, in the production of the Saveré company of Milan.

After having placed the connection formations **160** on the web **102** at its central region **1025**, it is typically coupled to a web of elastomeric material **106**, provided from an unwinding device of rolls (or reels) of elastomeric web material **600** well-known in the art, typically in an extended condition in the transverse direction Y, shown in FIG. **6**.

The web of elastomeric material **106** is also held in position and made to adhere to the first web material **102** with suitable anchoring means, which in the preferred embodiment can be the same suction holes **118** connected to the sub-atmospheric pressure source **80** with the vacuum distribution means **119**, which can act on the elastomeric web material **106** by exploiting the permeability to gases of the first web material **102**, which is typically a sheet of non-woven fabric and, therefore, breathable per se.

From the above, it is apparent why in the preferred embodiment it is necessary to keep the distal regions **1021** and **1022** of the first web material **102** blocked. In fact, if the first web material **102** was not retained at the side edges, it would not be able to resist the recall action of the elastomeric web material **106** and would, therefore, contract, curling transversely on itself.

The web of elastomeric material **106** is applied on the first web material **102** in the extended state in the transverse direction Y, i.e. in other words in a transverse direction relative to the longitudinal direction of the laminar web material **100**.

In a preferred embodiment, the degree of deformation (or extension) imparted to the web of elastomeric material **106** is in the order of 200%. This means that the web of elastomeric material **106** is applied onto the first web material **102** (making it adhere at its lateral margin due to the suction holes **118**), keeping it stretched transversely at a width essentially equal to three times the width that the web of elastomeric material **106** would present under resting conditions, i.e. in the absence of extension stress in the transverse direction.

In the preferred embodiment, as illustrated in FIG. **6**, the transverse extension of the elastomeric web material **106** is obtained by a spreading-apart device **126** comprising two wheels R**1**, R**2** with respective axes XR**1**, XR**2**, incident and oblique to each other.

The web of elastomeric material **106** is fed to the wheels R**1**, R**2**, where, due to the oblique arrangement of the respective rotation axes, the peripheries of the two wheels are closer together.

To allow the operation of transverse stretching of the web of elastomeric material, it is typically retained on the outer surface of the wheels R**1** and R**2** with appropriate retaining means, which may be, for example, a vacuum or retaining belts or, alternatively, side zones of the outer surface of the wheels R**1** and R**2** with a high coefficient of friction, or a combination thereof.

Due to the rotation of the wheels, the web of elastomeric material **106** is gradually carried to the area in which the peripheries of the wheels R**1**, R**2**, themselves are more distant from each other, obtaining the desired transversal deformation, and then proceeding to the application of the web of elastomeric material **106** on the layer **102** in this transversely extended condition.

A technique similar to the transverse extension of laminar materials is known in the art in various possible embodiments as shown, for example, in the document U.S. Pat. No. 5,308,345. This, therefore, means that a more detailed description of this solution in the context of the present application, is superfluous.

The anchoring action achieved by means of the vacuum of the suction holes **118** ensures that, even when disengaged from the transverse extension unit comprising the wheels R**1** and R**2**, the layer of material **106** maintains the extended condition. As already said, the vacuum holes **118** retains the extensible sheet of material **106** adhering to the first web material **102** which, in turn, is also retained in position adherent to the outer surface of the roller **25** by the vacuum of the holes **118**, so that—in spite of the action of elastic recall of the layer **106**—the composite web formed by the first web material **102** and by the elastomeric web material **106** is maintained in its extended form and does not contract transversely.

At this point, in the preferred embodiment illustrated in FIGS. **3** and **7**, the production apparatus **30** is typically fed with a second web material **104**, which is also supplied by an unwinding device of rolls (or reels) of web material **400**, well-known in the art. Typically, the second web material **104** is applied with its central region **1045** above the web of elastomeric material **106**, and with the distal regions **1041** and **1042** overlapping the respective distal regions **1021** and **1022** of the first web material **102** and the proximal regions **1661** of the connection formations **160** in such a way as to have the longitudinal edges **1043** and **1044** coincident with the edges **1023** and **1024**, respectively, so as to complete the sandwich structure of the laminar web material **100**.

Subsequently, the aforesaid sandwich comprising the web of elastomeric material **106** and the plurality of connection formations **160** interposed between the first and the second web materials **102** and **104** is subjected to a welding treatment, which combines the first and the second web

materials **102** and **104**, the connection formations **160** and the web of elastomeric material **106** with a plurality of welds **355** and **365**, which are typically produced by the welding devices **35** and **36**. The welds **355** and **365** give coherence to the sandwich structure and prevent the resulting transversely extensible elastic laminar web material **100** being affected by a delamination phenomenon (i.e. detachment) of the various elements **102**, **104**, **106** and **160** that compose it, preferably without the aid of adhesives.

In the illustrated embodiment, ultrasonic welding devices can represent a preferred choice capable, however, of being replaced with equivalent techniques, such as heat-sealing or cold pressure welding.

In the preferred embodiment illustrated in FIG. **3**, because of the different thicknesses and different types of materials to be welded, the welding treatment is typically implemented with more welding devices, which can be arranged adjacent to each other or in succession. Alternatively, the welding treatment could be implemented with just one welding unit, at the cost of a greater complexity of the possible welding device.

As can be seen from FIG. **3** that schematically illustrates the preferred embodiment, the welding devices **35** and **36** are arranged in succession, one after the other. The first welding device **35** (which is typically positioned upstream in the process, i.e. immediately after the lamination in the second web material **104**) preferably produces the coupling of the sheet of extensible material **106** with the first and the second web materials **102** and **104** between which it is interposed, forming the junction points or welds **355**, and can be constituted by at least one ultrasonic welding head. The second welding device **36**, which is typically placed immediately after the first welding device **35**, is responsible for forming the welds **365**, which connect the connection formations **160** with the web materials **102** and **104** and which join together the distal regions **1021**, **1022**, **1041** and **1042** of the two web materials **102** and **104** in the sections between two successive connection formations **160**.

The second welding device **36** may comprise at least one ultrasonic welding head, although preferably, as can be seen from FIG. **9**, the said second welding device **36** typically comprises two ultrasonic welding heads.

It is obvious that the arrangement illustrated in FIG. **3** is not binding and does not detract generality from the description. In fact, it could be possible to have the welding devices **35** and **36** in any other arrangement, i.e. the two welding units could be reversed or could be aligned.

Ultrasonic welding devices suitable for the applications described herein can be provided by Herrmann Ultraschalltechnik GmbH & Co. KG.—Descostrasse 3-9, 76307 Karlsbad—Germany. A device suitable for both welding processes is typically composed of an Ultrasonic Generator model DYNAMIC digital control 4000 CS, a titanium converter model CCS 20-S-IP50-L-I, a titanium Booster 20 KHz ratio 1:1.4 and a titanium Sonotrode 20 kHzλ=1/2, MS 85/45/16 Square.

In the preferred embodiment illustrated in FIG. **3** the welding treatment implemented by the first welding device **35**, which produces the sandwich material **102**, **104** and **106**, can typically give it the characteristic of breathability, which is the ability of a typically laminar material to be permeable to gases (air and steam) so as to allow the user's skin to "breathe".

Therefore, in the preferred embodiment, while the first and the second web materials **102** and **104** are typically webs of non-woven fabric—breathable per se—the web of elastomeric material **106**, which is typically a web of non-breathable material, during the welding step can be perforated and therefore can be made permeable to gaseous substances. This treatment is essentially similar to the formation of a pattern of openings **161** formed in the elastic material of the sandwich structure by means of appropriately-shaped protuberances of the welding pattern Ps, which is typically present on the outer surface **251** of the roller **25**.

Typically, the weld **355** of the first and the second web materials **102**, **104** and the hole **161** of the web of elastomeric material **106** are produced in a single step since the molecules of the material of the said web of elastomeric material **106** that are located at the protuberances of the pattern Ps when they are hit by the sonotrode due to the hammering action, migrate suddenly towards the edges of the protuberance of the said pattern Ps, leaving only the two web materials **102** and **104** to undergo the action of the ultrasonic welding device **35** which produces the weld **355**, represented in detail in FIG. **14**.

The view of FIG. **8** is intended to illustrate—in general terms—the various parts that come into play in the welding process implemented by the first welding device **35**, in which the parts are shown spaced-apart for clarity.

FIG. **9** illustrates, instead, the various parts that come into play in the welding process implemented by the second welding device **36**, and in this case as well, the aforesaid parts are shown spaced-apart for greater clarity.

The web **100**, produced as such, as soon as it leaves the production machine **30** is typically made to flow through a folding device **40** of the connection formations **160**, known in the art, which folds them on the web **100** itself around the respective longitudinal edges **110** and **120** according to a general V-shaped conformation. It is also possible to reinforce the binding of each connection formation **160** with the distal regions **1021**, **1022**, **1041** and **1042** of the web materials **102** and **104** through a compressing operation performed in a pressing station **45** located downstream of the folding device **40**. The pressing station **45**, also known in the art, is typically provided with a pair of contra-rotating rollers kept pressed against one another with suitable thrust means, such as pneumatic cylinders.

At the end of this treatment the web **100**, completed in its sandwich structure formed by the web materials **102** and **104** with the web of elastomeric material **106** and the connection formations **160** interposed between said web materials **102** and **104**, and optionally folded in a V-shape, can be sent directly to a production line of sanitary articles **10**, or can be wound around reels which, in turn, can be used at a later time on these production lines.

Once freed from the constraints that prevent the contraction and after having folded the connection formations **160**, the transversely extensible elastic laminar web material **100** assumes the transverse profile visible in the cross-section shown in FIG. **13**, where it can be seen that in the transversely extensible elastic laminar web material **100**, once the action of transverse stretching is removed, the web of elastomeric material **106** contracts itself to return to its original size (at rest), which causes the shrinking of the first and second web materials **102** and **104** forming transverse ripples on them in the areas in which they are not connected to each other and/or to the web of elastomeric material **106**.

The transversely extensible elastic laminar web material **100** described herein is, therefore, elastically extensible in the transverse direction starting from the resting condition represented in FIG. **13** up to an extended condition essentially similar to that shown in FIG. **9** which, as already said, represents half of the second welding device **36** and in which the condition is clearly visible in which the web of elasto-

meric material **106** is interposed in the transversely extended sandwiched condition between the two web materials **102** and **104** maintained in their original flat condition.

Once laterally extended, up to reaching this condition of maximum extension, the transversely extensible elastic laminar web material **100** then demonstrates marked resistance against any further attempt to transversely extend, as any further extension would entail the need to also transversely deform the first and second web materials **102** and **104** which, by their nature, are essentially inextensible.

In a further embodiment, illustrated in FIGS. **16** and **17**, it is advantageous to have a transversely extensible elastic laminar web material **100'**, which has the central region **1005'** devoid of elastication, from which it is possible to produce two webs **1008'** and **1009'** by longitudinal cutting of the web **100'**, similarly to that shown in FIG. **10**, from which the elastic side panels **16** can be obtained with non-elastic proximal regions **1602**, resulting from the central region **1005'** of the web **100'**, i.e. devoid of ripple characteristics of the elasticized parts, therefore easier to apply on the side edges of the central body **12** of the sanitary article **10**, as represented in FIG. **2**.

This characteristic can be achieved by cutting the web of elastomeric material **106** along its own longitudinal axis.

In particular, FIG. **15** refers to a solution in which once the web of elastomeric material **106** has been coupled to the first web material **102**, it is held in the extended condition not only by the suction holes **118** placed in the vicinity of its longitudinal edges, but also thanks to further anchorage means **118'** (which, in this case as well, can advantageously be suction holes connected to the sub-atmospheric pressure source **80** with appropriate vacuum distribution means **119**), which typically perform two linear patterns of holes **118'** placed laterally to the longitudinal axis of the web of elastomeric material **106**, in a more internal position with respect to the suction holes **118**, with a central longitudinal region devoid of anchoring means, which can have a width in the order of 1-2 cm. In these conditions, the web of elastomeric material **106** is cut along its longitudinal axis so as to form two portions of elastomeric web material **106** parallel to each other.

The longitudinal cutting operation of the web of elastomeric material **106** can be carried out, for example, by means of a knife Z rotating around an axis XZ exploiting the fact that, at the cutting point, the first web material **102** tends to automatically form a kind of cleft. This is because on the outer surface **251** of the roller **25**, an annular groove **252** is typically formed in which said first web material **102** is wedged, forming a wrinkle that is not affected by the action of cutting.

The cutting operation, conducted when the web of elastomeric material **106** is maintained in the transversely extended form, means that the portions of this web comprised between the anchorage means **118'** and the cutting line, and which are located on the central longitudinal region of the roller **25** devoid of anchoring means, can retract, consequently forming two tails **106'** of extensible elastomeric material that are no longer extended.

Once the longitudinal cutting of the elastomeric material web **106** has been carried out, coupling is performed of the second web material **104** to the first web material **102**, interposing between them the two parallel web portions of elastomeric material **106** and the connection formations **160** between them. Subsequently, the sandwich structure thus composed can be subjected to the welding process and to any other folding processes **40** and reinforcing pressing **45** of the connection formations **160**.

The result that follows is the formation of webs of composite material **100'**, **1008'**, **1009'** illustrated in FIGS. **16** and **17**, which have a structure essentially similar to that of the webs **100**, **1008**, **1009** described above, but with a central region **1005'** and, respectively, proximal regions **1062**, not elasticized.

In a further embodiment illustrated in FIG. **18**, the production of a transversely extensible elastic laminar web material **100"** provided with connection formations **160** can be implemented by applying one or more webs of elastomeric material **106** between the first and the second web materials **102** and **104** in the transversely relaxed conditions (i.e. not transversely extended). In said embodiment, therefore, the elastic material **106** is not stretched transversely by the spreading-apart device **126**, which is typically replaced by a simple cylindrical roller.

Therefore, in the aforesaid further embodiment, the transversely extensible elastic laminar web material **100"** comprising the web of elastomeric material **106** in a relaxed condition and the plurality of connection formations **160** interposed between the first and the second web materials **102** and **104**, after having been subjected to the welding treatment but before being directed to the folding **40** and pressing **45** devices of the connection formations **160** already described above, can be made transversely extensible by causing it to flow through an activation device of the elastic material, which lengthens the elastomeric web material **106** in the transverse direction Y, permanently deforming the first and the second web materials **102** and **104**.

An activation device of the elastic material advantageously applicable in the preferred embodiment can be the activation apparatus of the elastic material described in the document EP 1 982 823 B1 entitled "Method and device for treating web material" owned by the applicant.

Each transversely extensible elastic laminar web material **100**, **100'** and **100"** thus obtained can be wound into rolls, then the rolls thus formed can be directed towards a utilization process, proceeding, if necessary, to their separation (i.e. to the longitudinal cutting of the sandwich **100**, **100'** and **100"** as exemplified in FIG. **10**, to form webs **1008**, **1008'**, **1009**, **1009'**) only at a later step of the manufacturing process of the disposable absorbent product, for example in the moment in which the two webs **1008**, **1008'**, **1009**, **1009'** are produced as they are intended to form elastic side panels located on opposite sides of the same sanitary product **10**.

Of course, without prejudice to the principle of the invention, the details of construction and the embodiments can be varied, even significantly, with respect to those illustrated here, purely by way of non-limiting example, without departing from the scope of the invention as defined by the attached claims. This applies in particular, but not exclusively, to the possibility—already mentioned above—to use different materials for the purposes of producing the sandwich **102**, **104**, **160** and **106**, from those to which reference was previously made by way of example. For example, one or both layers **102** and **104** may be constituted, instead of a non-woven fabric, by a film of plastic material such as polythene. As a further example, the elastic material could be a polyurethane foam that, by already being a breathable material per se, further increase the breathability of the side panels **16**.

The invention claimed is:

1. A method for producing a transversely extensible elastic laminar web material comprising the steps of:

feeding a first web material permeable to gases having a first and a second distal region adjacent to respective longitudinal side edges and a central region between said distal regions;

placing the first web material on an outer surface of a cylindrical roller, rotating around its own horizontal axis;

retaining said first and second distal regions on the outer surface of said roller and keeping said first web material in an extended condition by a plurality of suction holes and a vacuum distribution system, which connect the outer surface of the roller with a sub-atmospheric pressure source;

feeding a plurality of connection formations;

applying said plurality of connection formations to at least one of said first and second distal regions of said first web material, said connection formations protruding from said respective longitudinal side edge of said first web material;

holding in position on the roller said plurality of connection formations by said suction holes connected to said sub-atmospheric pressure source by said vacuum distribution system;

feeding a web of elastomeric material;

coupling said web of elastomeric material to said first web material at said central region of said first web material;

holding in position and making to adhere said web of elastomeric material to the first web material by said suction holes connected to the sub-atmospheric pressure source by said vacuum distribution system;

feeding a second web material having a first and a second distal region adjacent to the respective longitudinal side edges and a central region between said distal regions;

coupling said second web material to said first web material with said elastomeric web material and said plurality of connection formations interposed between them; and

joining said elastomeric web material and said plurality of connection formations to said first and second web materials with mechanical welds.

2. A method according to claim 1, wherein said elastomeric web material is fed and maintained in a transversely extended condition.

3. A method according to claim 2, wherein said elastomeric web material is cut longitudinally so as to form two parallel portions of said elastomeric web material having inner edges facing each other and free to partially retract towards the respective longitudinal side edges of said first web material, before said step of coupling said second web material to said first web material.

4. A method according to claim 1, wherein said welds create an array of openings in said elastomeric web material that confer characteristics of permeability to gases to said elastomeric web material.

5. A method according to claim 1, further comprising applying said plurality of connection formations to each of the distal regions of said first web material at a constant spacing pitch.

6. A method according to claim 5, wherein said connection formations are applied to said first and second distal regions of said first web material juxtaposed to each other.

7. A method according to claim 6, wherein said connection formations are applied to said first and second distal regions of said first web material offset from each other.

8. A method according to claim 5, comprising the additional step of longitudinally cutting said transversely extensible elastic laminar web material.

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